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10/582,341	06/09/2006	Tomoya Sugita	28951.1176	4982

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EXAMINER	
BEDTELYON, JOHN M	

ART UNIT	PAPER NUMBER
2874	

MAIL DATE	DELIVERY MODE
03/09/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Supplemental Notice of Allowability	Application No.	Applicant(s)	
	10/582,341	SUGITA ET AL.	
	Examiner	Art Unit	
	JOHN M. BEDTELYON	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment and remarks submitted 10/20/2008*.

2. ☒ The allowed claim(s) is/are *8-19*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Supplemental Allowance

1. This action corrects some informalities within the specification in order to allow the application. The Examiner's Amendment removes some claim numbering within the specification.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Daniel Shim (Reg. No. 56,995) on 02/12/2009.

Please amend pages 5-10 of the specification as follows:

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has a uniform output light intensity distribution, a laser light source that employs the optical element, and a two-dimensional image forming apparatus that employs the laser light source.

MEASURES TO SOLVE THE PROBLEMS

In order to solve the above-described problems, according to ~~claim 1~~one embodiment of the present invention, an optical element comprises: a plurality of waveguides transmitting a

light; a plurality of light path coupling parts coupling adjacent waveguides so as to optically couple said plural waveguides serially, and the paths for transmitting lights through the plural waveguides are curved at least one part of said optical path coupling parts.

Thereby, the incident laser light can be converted into the emitted light having uniform cross-sectional light intensity distribution by quite compact optical elements.

~~According to claim 2 of the present invention, there is provided~~Such an optical element ~~as defined in claim 1, wherein~~may include an odd number of waveguides are provided as said plural waveguides, and said odd number of waveguides are disposed overlapping with each other in parallel with respect to the light transmission direction of said waveguides.

Thereby, the advancing direction of the light incident to the optical element and the advancing direction of the light that is outputted from the optical element can be made the same direction, and therefore, the device structure for mounting the optical elements can be simplified.

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~~According to claim 3 of the present invention, there is provided~~Such an optical element ~~as defined in claim 1, wherein~~may also include external surfaces other than the light incident surface and the light output surface of the waveguide path comprising said waveguides and said light path coupling parts are coated by a reflection film reflecting the transmitting light.

Thereby, it is possible to transmit the light incident into inside the waveguide with efficiently reflecting the same.

~~According to claim 4 of the present invention, there is provided~~In such an optical element ~~as defined in claim 1, wherein~~ said light path coupling parts may have inclined surfaces which

are inclined with respect to the plain vertical to the light transmission direction and are integrated with said waveguides at either or both of said adjacent waveguides.

Thereby, it is possible to reduce a number of parts in the light path coupling parts.

~~According to claim 5 of the present invention, there is provided~~Such an optical element ~~as defined in claim i, wherein said~~also may include waveguides ~~are~~ of a hollow structure in which either of gas or liquid and Brownian particles are sealed.

Thereby, it is possible to reduce speckle noises that are generated in a laser light source having a high coherency.

~~According to claim 6 of the present invention, there is provided~~In such an optical element ~~as defined in claim 5, wherein~~ said Brownian particles ~~are~~may be colloid particles.

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Thereby, it is possible to make appropriately random the phase of the light incident to the waveguide.

~~According to claim 7 of the present invention, there is provided~~In such an optical element ~~as defined in claim 1, wherein~~ the distance along the light transmission path from the light incident surface to the light output surface ~~satisfies~~may satisfy the following equation (1):

$L \geq W/\tan(\sin^{-1}(\sin(\Theta/2)/n)) \ldots (1)$

W: width of the waveguide

n: refractive index inside the waveguide

Θ: the minimum beam spread angle possessed by the semiconductor laser.

Thereby, it is possible to produce an optical element that can convert the incident laser light to an output light having a uniform cross-sectional light intensity distribution in a size that is to the minimum within the required.

~~According to claim 8 of the~~The present invention~~, there is provided~~also may include a laser light source comprising a semiconductor laser and an optical element which emits the laser light which is emitted from said semiconductor laser with transmitting the same, wherein said optical element includes a plurality of waveguides transmitting light, and a plurality of light path coupling parts coupling adjacent waveguides so as to optically couple said plural waveguides serially, and the path of the light for transmitting the light through the plural waveguides are curved

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at said optical path coupling part.

Thereby, it is possible to provide a quite compact laser light source that outputs an output light having a uniform cross- sectional light distribution intensity.

~~According to claim 9 of the present invention, there is provided~~Such an optical element ~~as defined in claim 8, wherein there is provided~~may also include a convex lens or a plano-convex lens which is disposed on an optical path between the semiconductor laser and the optical element and makes the spread angle of the laser light incident to the optical element smaller than the spread angle of the laser light that is emitted from the semiconductor laser.

Thereby, it is possible to realize a light source making the cross-sectional light intensity distribution uniform which can convert the spread angle of the light emitted from the optical

element to an arbitrary angle. As a result, since the spread angle of the output light from the optical element can be made small, it is possible to make the light emitted from the optical element one that is easy in being handled.

~~According to claim 10 of~~In the present invention, ~~there is provided~~ a laser light source ~~as defined in claim 8, wherein~~may include a cylindrical lens ~~is~~ disposed on a light path between said semiconductor laser and said optical element.

Thereby, it is possible to convert the elliptical shape light beam that is outputted from the semiconductor laser to a light beam having a circular shape that is easy to handle.

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Further, even when the cross-sectional configurations of the respective waveguides are designed to be in a rectangular shape having an arbitrary aspect ratio, a laser light source having an arbitrary output beam aspect ratio that can accomplish a uniform output light cross-sectional intensity distribution with a short optical path length efficiently by selecting the curvature of the cylindrical lens can be obtained, thereby the design of the configuration of the optical element is made without any inhibition.

~~According to claim 11 of the present invention, there is provided a~~In the laser light source ~~as defined in claim 10, wherein~~, the cylindrical lens ~~is~~may be a plano-concave lens.

Therefore, it is possible to broaden the spread angle only in one axis direction of the light that is incident to the optical element, and as a result, the entire optical length of the optical element that is required for making uniform the output light cross-sectional intensity distribution can be reduced.

~~According to claim 12 of the present invention, there is provided a~~And, in the laser light source ~~as defined in claim 8, wherein~~ the light incident surface of the optical element ~~is~~may be in a curved configuration having curvature.

Thereby, it is not needed to dispose a lens on an optical path between the semiconductor laser and the optical element, and therefore, a compact laser light source is obtained.

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~~According to claim 13 of the~~The present invention~~, there~~ is ~~provided~~also embodied in a two-dimensional image forming apparatus comprising: a laser light source emitting a laser light; a space optical modulation part that modulates a laser light emitted from the laser light source; and an illumination optical system for illuminating the laser light that is outputted from the laser light source to the space light modulation part, wherein said laser light source has a plurality of waveguides transmitting a light, and a plurality of light path coupling parts coupling adjacent waveguides so as to optically couple said plural waveguides serially, and the paths for transmitting lights through the plural waveguides are curved at said optical path coupling parts.

Thereby, it is possible to provide, as a laser light source used in a two-dimensional image forming apparatus, one which is quite a compact laser light source that outputs an output light having a uniform cross-sectional light distribution intensity.

~~According to claim 14 of the present invention, there is provided a~~The two-dimensional image forming apparatus ~~as defined in Claim 13 wherein there is provided~~may include a projection optical system which projects the laser light that is emitted from the space optical modulation part.

Thereby, quite a compact two-dimensional image formation system which has quite simple parts constructions can be realized.

Allowable Subject Matter

3. Claims 8-19 are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. BEDTELYON whose telephone number is (571)270-1290. The examiner can normally be reached on Monday - Friday, 10:00am - 6:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Uyen-Chau Le can be reached on 571-272-2397. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JMB/
Examiner, Art Unit 2874

/Kevin S Wood/
Primary Examiner, Art Unit 2874